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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Takayoshi Mamine

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EXAMINER

BABIC, CHRISTOPHER M

ART UNIT

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1637

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PAPER

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

<b>Office Action Summary</b>	<b>Application No.</b> 10/529,949	<b>Applicant(s)</b> MAMINE ET AL.	
	<b>Examiner</b> CHRISTOPHER M. BABIC	<b>Art Unit</b> 1637	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 27 February 2008.
- 2a) ☒ This action is **FINAL**.                      2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-4 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-4 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)            | 4) <input type="checkbox"/> Interview Summary (PTO-413)           |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)   | Paper No(s)/Mail Date. _____                                      |
| 3) <input checked="" type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date <u>3/14/2008; 2/29/2008</u> .                                    | 6) <input type="checkbox"/> Other: _____                          |

## **DETAILED ACTION**

### ***Status of the Claims***

Claim(s) 1-4 are pending. The following Office Action is in response to Applicant's communication dated February 27, 2008.

### ***Information Disclosure Statement***

Applicant is advised that if an English translation of a cited foreign language reference is not provided, it will not be considered. Abstracts will be considered if a proper translation is provided.

### ***Claim Rejections - 35 USC § 102 - Withdrawn***

Applicant's claim amendments are sufficient to overcome the rejection of claim(s) 1 and 2 over Lee, claims 1 and 2 over Thundat, and claims 1-4 over Quate. None of the applied references teach application of a concentrated uneven electric field. Thus, the rejections have been withdrawn.

### ***Claim Rejections - 35 USC § 103 - New Grounds***

The following rejection(s) are made in view of Applicant's amendments. The extensive amendments to claim 1 now require active method steps (e.g. vibrating and exciting) that were previously recited as an "intended use" of the required apparatus

parts, and thus, were not required by the claimed invention. The new grounds of rejection presented below reflect such changes to the claimed invention.

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

**1. Claim(s) 1, 3, and 4 are rejected under 35 U.S.C. 103(a) as being unpatentable over Quate et al. (U.S. 6,203,981 B1) in view of Wachter et al. (U.S. 5,445,008), and in further view of Washizu et al. ("Electrostatic manipulation of DNA in microfabricated structures," IEEE Trans. Ind. Applicat., vol. 26, pp. 1165-1172, 1990).**

With regard to claims 1 and 3, Quate teaches methods for detecting hybridization of target nucleic acids (fig. 1-4; col. 5-6, for example) comprising: providing a cantilever comprising immobilized oligonucleotides (fig. 1, 11; col. 4, lines 25-40, for example); introducing a sample comprising oligonucleotides complementary to that of those immobilized on the cantilever (col. 4, lines 25-40, for example); and detecting hybridization based on a change in resonant frequency (col. 4, lines 25-40, for example).

Quate does not expressly teach actively vibrating and exciting the cantilever by using a driving source or forming an uneven electric field at the surface of immobilized oligonucleotides.

With regard to the vibration of the cantilever, Wachter provides a supportive disclosure that teaches actively vibrating and exciting a coated cantilever with a driving force (fig. 1, 10, 12, 14; col. 1, lines 45-end, for example), exposing a target compound to the oscillating cantilever (col. 1, lines 45-end, for example), and detecting the binding of the target to the cantilever by measuring change in resonant frequency (col. 1, lines 45-end; fig. 5, for example).

With regard to the formation of an uneven electric field at the surface of immobilized oligonucleotides as well as claim 4, Washizu provides a supportive disclosure that teaches the application of an uneven electric field to immobilize and stretch DNA molecules (pg. 1166, section III, experimental method, for example). The reference expressly teaches that the methods can be used to neatly align DNA

molecules on substrates within biosensors as well as position DNA molecules on the edge of strips or pinpoints (pg. 1171, col. 1, for example).

Thus, in summary, it is submitted that it would have been *prima facie* obvious to a skilled artisan at the time of invention to utilize a driving source to vibrate the cantilever within Quake since the prior art demonstrates such a technique as useful for the detection of a target binding to a cantilever.

Furthermore, it would have been *prima facie* obvious to a skilled artisan at the time of invention to concentrate an uneven electric field at the immobilized oligonucleotides on the surface of the cantilever within the detection methods of Quake since the prior art suggests such a step to neatly align DNA molecules on the substrate.

**2. Claim(s) 2 is rejected under 35 U.S.C. 103(a) as being unpatentable over Quate et al. (U.S. 6,203,981 B1) in view of Wachter et al. (U.S. 5,445,008), and in further view of Washizu et al. ("Electrostatic manipulation of DNA in microfabricated structures," IEEE Trans. Ind. Applicat., vol. 26, pp. 1165-1172, 1990) as applied to claim 1 above, and in further view of Yamamoto et al. (U.S. 5,268,571).**

The teachings of the previously applied reference(s) have been outlined in the above rejections. The previously applied reference(s) do not expressly teach a cantilever having a piezoelectric material disposed between counter electrodes and subsequent vibration with application of AC voltage between the counter electrodes.

Yamamoto provides a supportive disclosure that teaches a microcantilever having a piezoelectric material disposed between counter electrodes and subsequent vibration with application of AC voltage between the counter electrodes (fig. 1; col. 4, lines 30-end, col. 5-6, example 1, for example). The reference shows the cantilever to have excellent responsiveness (col. 6, lines 25-35, for example).

Furthermore, it would have been *prima facie* obvious to a skilled artisan at the time of invention to utilize counter electrodes to vibrate a piezoelectric cantilever, such as those in Wachter, since the prior art demonstrates such a arrangement .as useful for providing a cantilever with excellent responsiveness.

### ***Conclusion***

**Claim(s) 1-4 are rejected. No claims are allowed.**

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

Fritz et al. ("Translating biomolecular recognition into nanomechanics" Science. 2000 Apr 14;288(5464):316-8). Fritz teaches utilizing cantilevers for detection of nucleic acid hybridization; however, the reference is silent with regard to concentration of an uneven electric field.

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christopher M. Babic whose telephone number is 571-272-8507. The examiner can normally be reached on Monday-Friday 7:00AM to 4:00PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Gary Benzion can be reached on 571-272-0782. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.



Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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